Ultrasonographic Diagnosis and Ultrasonic Reduction of Intussusception in Nnewi, South-East Nigeria

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Abstract

Background: Intussusception is a common cause of intestinal obstruction among infants. Delayed diagnosis and treatment worsen the outcome with possible mortality. At present, ultrasonography is the preferred tool for both diagnosis and treatment for select cases. It is also useful in the diagnosis of comorbidities and as a guide to pneumatic and hydrostatic reduction of intussusception. **Aim:** The aim of this study is to evaluate the ultrasound features of intussusceptions and to correlate its findings with surgical findings at a tertiary health-care facility. **Materials and Methods:** This is a retrospective study carried out at Nnamdi Azikiwe University Teaching Hospital, Nnewi, South-east Nigeria, between 2014 and 2016. Data were extracted from case notes, theater records, and radiology, and the following domains were explored: sociodemographic data, ultrasound findings, and intraoperative findings. The data obtained were recorded in an Excel Spreadsheet and were analyzed using the SPSS software version 20, and the results were reviewed in tables and charts. **Results:** A total of 15 patients that met the inclusion criteria were used for this study. There were more males than that of females, and the peak age was between 4 and 6 months. Most of the patients were scanned and operated after 24 h from the onset of symptoms. The most common presenting symptom was vomiting, and most of the masses were in the right hemiabdomen. **Conclusion:** The sensitivity of ultrasound in our study was 100%, and this correlates with the findings in other studies. The use of ultrasound early in patients with increased clinical suspicion will, therefore, help to reduce the unnecessary delays in intervention and therefore reduce the complications.

Keywords: Accuracy, hydrostatic reduction, intussusception, ultrasonography

Introduction

Intussusception is the invagination or telescoping of a bowel segment into another. Usually, it is a proximal part of the bowel that invaginates into the distal segment. It is one of the most common causes of intestinal obstruction in infants and toddlers. The peak incidence is found in children aged between 4 and 6 months.[1,2] Moreover, it is more common in males than females, with a male-to-female ratio of 3:1–2.[3,4]

Delays in the diagnosis and reduction may lead to complications such as intestinal obstruction, bowel ischemia, and necrosis.[5-7] Other complications such as perforation, shock, sepsis, and dehydration may also occur; therefore, timely diagnosis and reduction are imperative to reduce mortality and morbidity.

There is no pathologic lead point in more than 90% of childhood intussusceptions. This is the reverse of what is seen in adult patients. It is thought that most are due to lymphoid hyperplasia following viral infection or uncoordinated peristalsis of the gut.[8-11] The remaining 10% may be due to Meckel's diverticulum, polyp, lymphoma, duplication cyst, intramural hematoma, ameboma, and Henoch-Schonlein purpura.

Colicky abdominal pain, bloody stool (currant jelly), and palpable abdominal mass or vomiting make up the clinical triad and has a great positive predictive value for intussusception in children.[12]

However, this triad is only seen in <50% of the cases of intussusception.[13] Other symptoms include lethargy,

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somnolence, and abdominal distension in those presenting late.

Greater number of intussusception are ileocolic type, accounting for over 80% of cases in children followed by ileoileocolic, ileoileal, and colocolic.[14]

Radiological imaging serves both as diagnostic and therapeutic tool in the management of intussusception. It is of utmost importance in the early diagnosis as clinical presentation can be unreliable. Barium enema was used in the diagnosis and treatment of intussusception, and it was the first method of image-guided reduction before ultrasonography.[15]

Currently, ultrasonography is recommended as the initial imaging when there is a high clinical suspicion, especially when there are two or more cardinal symptoms.[16-19]

Ultrasound sensitivity at diagnosing intussusceptions is 98%–100% and specificity of 88%–100%.[20]

Ultrasonography has the added advantage of diagnosing other pathologies with similar clinical features. It also guides pneumatic or hydrostatic reduction and can pick up a pathological lead point. It is not limited by time, and examination can be repeated because it does not use ionizing radiation unlike enema reduction using conventional X-rays with fluoroscopy.

A plain abdominal radiograph is indicated when the symptoms are vague, but its sensitivity at detecting intussusception is as low as 45%.[21]

Abdominal computed tomography also has an accuracy of 100%, but high cost, risk of radiation, and risk of sedation in children with intestinal obstruction make it impracticable.

The aim of our study is to evaluate the ultrasound features of intussusception and correlate it with surgical findings at a tertiary health-care facility in South-east Nigeria.

Materials and Methods

This is a retrospective study of 15 children managed for intussusception at a tertiary health-care facility from 2014 to 2016 (3 years). All patients 18 years and above were excluded from the study.

The medical records of these patients were retrieved, and age, gender, presenting complaints, duration of presenting complaints, ultrasound findings, locations of intussusceptions, surgical findings, and status at discharge were recorded and analyzed.

The abdominal ultrasound was performed with an Aloka Prosound (ssd – 3500) ultrasound machine device manufactured by L and Y Aloka, Hitachi, USA, using curvilinear and linear transducers of 3–5 MHz and 7.5–8 MHz frequencies.

Ultrasound features recorded were target-like appearance of the wall layers on transverse scans and pseudokidney appearance on the oblique scan. Type of intussusception, presence of intraperitoneal fluid, and any other abnormality were also recorded.

Color Doppler evaluation of the mass was also done to ascertain the blood flow.

The modality of treatment whether hydrostatic reduction, operative interventions and comparison between the two modalities were noted. Definitive diagnoses were also obtained from the patient's records. The data obtained were analyzed with the SPSS software (version 20.0 SPSS hic. Chicago, IL, USA).

Results

The duration of presenting complaint from the onset to ultrasound shows that most of the patients were scanned after 24 h.

Doppler interrogation was done in five of the patients. There is no record of Doppler interrogation in the rest of the patients that had ultrasound scan [Table 1].

The most common presenting complaints were vomiting (1) and bloody stools (10). Other clinical presentations include fever (8), abdominal distension (4), watery stool alone (7), cough (3), weakness (1), and abdominal pain.

Mixed echogenic masses (alternating hypoechoic and hyperechoic) were seen in 15 patients which presented as target sign on transverse ultrasound scan and pseudokidney sign on oblique scan. Free intraperitoneal fluid was seen in five patients.

The location of the masses was right side of the abdomen (7), left side (5), epigastrum (1), and pelvis (2).

The two associated findings are inflamed appendix (1) and umbilical hernia (1).

The bowel loops were gangrenous in eight patients, whereas 7 were viable. Ultrasound diagnosis of gangrene which was confirmed at surgery was made in five patients.

Out of all the patients that had intussusception, 14 were discharged home, whereas 1 died postoperative.

Discussion

Intussusception is one of the most common causes of intestinal obstruction in children. It is more common in males than that of females with a ratio of 3:1–2.[3,4] This compares with our finding of male-to-female ratio of 4:3 [Figure 1].

The age range of occurrence in most children is between 3 months and 2 years, with a peak incidence between 5 and 7 months.[22] This is also similar to our age range of 3 months to 9 years and peak incidence between 4 and 5 months [Figure 2].

Ayaz *et al*.[17] found that the most common location of intussusception is ileocolic which is also the case in our study with a record of 87% ileocolic, 6.5% ileoileocolic, and 6.5% colocolic intussusception.

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Timely diagnosis and intervention are important for successful management of intussusception. Prolonged intussusception may result in bowel necrosis and/or perforation of the gut. A greater number of our patients (6, 40%) presented for ultrasonography more than 24 h after the onset of the symptoms. Ekenze and Mgbor[23] discovered that the presentation of more than 24 h predisposes to bowel complications such as increased irreducibility and devitalized bowel at surgery, and this high incidence of bowel complications might favor primary surgical intervention in most of the cases [Figure 3].[23]

Delayed presentation is relatively common in many developing countries.[22-24] Ayaz *et al*.[17] also found that surgery was performed in cases presenting with a delayed referral. This could explain why most of our patients had surgical reduction (61.9%) with 38.1% having gangrenous bowel at the surgery.

The incidence of surgery in different parts of the world varies from 13% in Asia, 20% in Europe, 28% in North America, 29% in Oceania and East Mediterranean, 77% in Africa to 86% in Central and South America.[22]

Surgery is a sure way of managing intussusception and the complications that may be associated with it,[25] but ultrasound-guided hydrostatic reduction is a relatively simple procedure, which does not need full general anesthesia for surgical intervention. It is associated with less morbidity, and patients have a relatively shorter hospital stay.[25]

Surgery is advocated for patients in shock when resuscitation fails or when there is evidence of bowel necrosis, peritonitis, or perforation and for those who present late, all other patients with the ultrasound diagnosis of intussusception should have ultrasound-guided reduction primarily.

Ultrasound-guided reduction has been proven to have an advantage over enema reduction in that it does not use ionizing radiation and offers the opportunity for repeat reductions with saline.

The classic triad of acute colicky abdominal pain, currant-jelly stools, and a palpable abdominal mass is present in <50% of children with intussusception.[13] The clinical triad was not seen in any of the 15 patients in our study, and this may be because, in most of the cases, complications had already set in again, this might be one of the limitations as a retrospective review.[23] When blood flow is not visualized at the Doppler scan, the rate of reduction is lower.[26] Most of our patients did not undergo Doppler interrogation. There is because of the dearth of information on Doppler as it relates to hydrostatic reduction. This is also the problem in retrospective studies. Ultrasonography is recommended as the initial imaging when there is a high clinical suspicion, especially when there are two or more cardinal symptoms.[16-19]

Ultrasound sensitivity at diagnosing intussusception is 98%–100% and specificity of 88%–100%.[20] In our study, ultrasound sensitivity is 100%. Ultrasound diagnosis of intussusception was made based on the presence of a mass

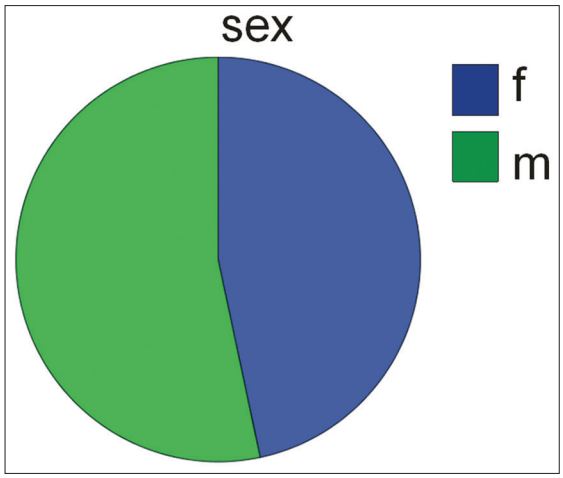

Figure 1: Pie chart showing sex distribution

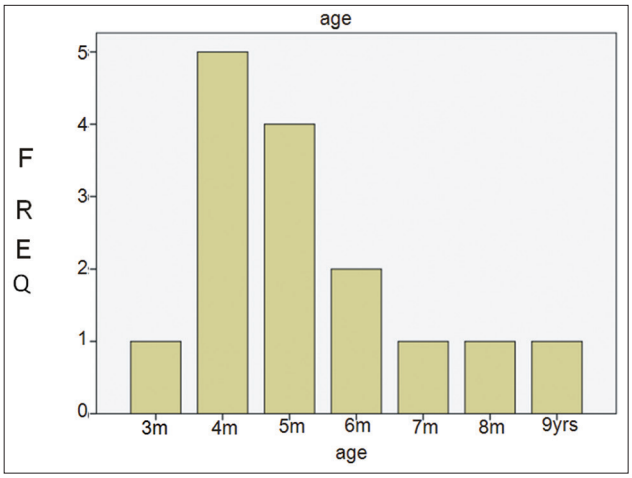

Figure 2: Bar chart showing age distribution. The most common age of occurrence is 4 months followed by 5 months

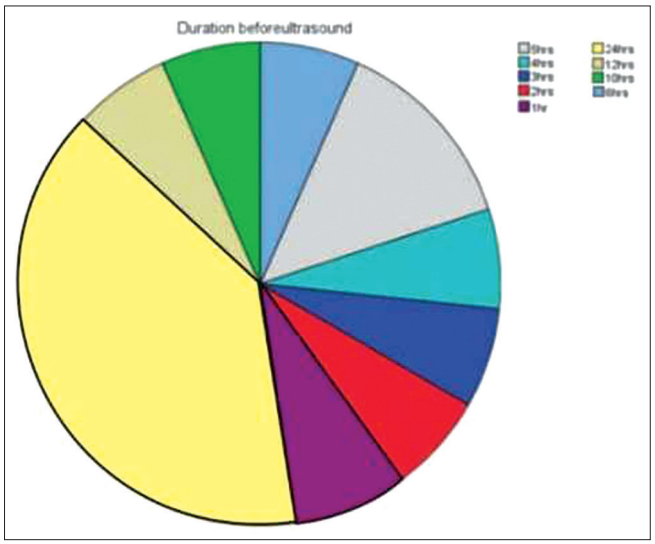

Figure 3: Pie chart showing duration from the onset of symptoms to ultrasound. The duration of presenting complaint from onset to ultrasound shows that most of the patients were scanned after 24 h

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Table 1: Color Doppler sonography in the management of intussusception

Number of patients	Color Doppler sonographic findings	Surgical findings	Interventions
2	No flow	Gangrene	Segmental resection/anastomosis
1	Minimal flow	Gangrene	Segmental resection/anastomosis
2	Good color flow	No surgery	Ultrasound-guided hydrostatic reduction

of alternating echogenicity, target (transverse scan), and pseudokidney (oblique scan) signs. The ultrasound diagnosis of intussusception was consistent with the findings at the surgery in all the 15 patients.

Justice *et al*.[27] found the sensitivity of abdominal ultrasound in the detection of intussusception in infants younger than 2 years of age as 97.5% and specificity as 99%. Usang *et al*.[28] in Calabar also found that ultrasound is highly accurate in the diagnosis of intussusception in highly experienced hands with a sensitivity of 87%. Ultrasound is also useful at diagnosing other possible pathologies with similar clinical presentations. An associated finding of inflamed appendix was made in one of the patients we reviewed. Bhisitkul *et al*. reported ultrasound to be a rapid procedure in the positive diagnosis or exclusion of childhood intussusception.[29] There was no lead point seen in any of the patients which are also supported by other works that found the incidence of lead point occurring in children to be 1.5%–12%.[30,31]

Free peritoneal fluid was seen in five of the patients. Identification of free intraperitoneal fluid does not necessarily indicate the presence of complications such as peritonitis or perforations but fluid trapped between intussuscepted bowel segments that can be seen in <15% of cases seem to correlate with a lower reduction rate.[32]

Our findings of three of five patients that underwent color Doppler sonography showed that two had good color flow had a successful hydrostatic reduction, while one with described minimal flow was found gangrenous at the surgery and underwent segmental resection. The two without flow showed gangrene at the surgery. These findings and outcomes agreed with the findings in other studies. Lim *et al*.[33] in their study of 65 intussusception patients with 62 showing flow that 58 (94%) had hydrostatic reduction, whereas 3 of the other 4 underwent manual reduction at the surgery. This showed that color Doppler sonography is a good indicator of bowel viability and hence success at hydrostatic reduction. In another study in Iran, Nemati *et al*.[34] showed 61.4% nonsurgical management of patients with flow in color Doppler and 88% of the remaining 24 had manual reduction at surgery, whereas only 3 (12%) had segmental resection. This also showed that the presence of good color flow activity is a strong indicator of bowel viability and also a pointer to high success at a hydrostatic reduction. Hence, inclusion of color Doppler sonography early in patients with a high clinical suspicion of intussusception will reduce the use of surgery and lead to early hydrostatic reduction and a reduction in complications emanating from the surgery.

Conclusion

Ultrasonography is the imaging modality of choice in children with symptoms suspicious of intussusception. It is not only diagnostic but also a therapeutic tool. For this benefit to be maximized, it is important that doctors in general practice should refer patients with symptoms suggestive of intussusceptions early enough. In these patients referred early, both B mode and Color Doppler modes will be used in the diagnosis and also decide on viability of gut wall that help in decisions on ultrasound-guided reduction or the need for surgery. Ultrasound has limitations in depicting the lead point, diagnosing gangrenous gut or perforation. In suspicions of complications, plain radiograph and clinical features may be more helpful.

Ultrasound-guided hydrostatic reduction is also a preferred choice of reducing intussusception, but the early presentation is imperative for a successful reduction. Ultrasound-guided hydrostatic reduction is a treatment of choice in children that presents early with symptoms and signs suspicious of intussusception. It has an advantage over barium reduction in that it does not use ionizing radiation; therefore, the investigation can be repeated.

It's obvious advantage over surgical reduction such as reduced hospital stay, not using anesthesia and other requirements for surgical reduction, reduced morbidity, and mortality is also what makes it a primary choice of the treatment.

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Conflicts of interest

There are no conflicts of interest.

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